

Bliss Nitrate Priority Area

Ground Water Quality Management Plan



This plan meets the requirement set forth in Policy PM00-04 to address the Bliss area of concern.

Contents

| | |
|--|-----|
| Executive Summary..... | iii |
| Section 1: Background | 1 |
| Authorities | 4 |
| Section 2: Management Plan Goals..... | 5 |
| Section 3: Management Plan Approach | 5 |
| Section 4: Management Plan Objectives | 6 |
| Section 5: Strategies For Implementation..... | 6 |
| Section 6: Problems And Recommendations | 7 |
| Section 7: Implementation Tasks | 8 |
| Section 8: Evaluation of Management Plan Progress and Success..... | 10 |
| Section 9: Responsibilities | 10 |

Tables

| | |
|---|---|
| Table 1. Problems and Recommendations..... | 7 |
| Table 2. Implementation tasks, implementing agencies, and timeframes..... | 8 |

Figures

| | |
|---|---|
| Figure 1. Map of nitrate priority areas in Idaho..... | 2 |
| Figure 2. Bliss Nitrate Priority Area with locations of dairies and State monitoring wells..... | 3 |

Executive Summary

Ground water monitoring results in the Bliss area have shown elevated levels of nitrates. The Idaho Department of Environmental Quality (IDEQ), the Idaho Department of Water Resources (IDWR) and the Idaho State Department of Agriculture (ISDA) agree that nitrate¹ is the most widespread preventable ground water contaminant in Idaho and that the problem is increasing in extent and severity. Over 95% of the drinking water consumed in Idaho is supplied by ground water and because this resource is so vital, strategies that eliminate or minimize nitrate contamination in the environment are critical.

Elevated nitrate levels can pose a health problem in both humans and animals. It can also be an indicator of other water quality problems. Nitrate levels tend to increase when contaminants, such as fertilizer, livestock manure, or septic waste reaches a water supply. Approximately 3% of Idaho's wells sampled through the Ambient Statewide Ground Water Quality Monitoring Program have nitrate-nitrogen concentrations exceeding the federal drinking water Maximum Contaminant Level (MCL). Another 30% of Idaho's wells have impacted levels of nitrate between 2 and 10 mg/l (Neely and Crockett, 1999). Within the Bliss Nitrate Priority Area approximately 39% of the sampled wells contained nitrate concentrations greater than 5 mg/L.

The federal regulatory level for nitrate concentration in human drinking water is 10 milligrams per liter (mg/l). This standard is based on studies assessing the risk of developing methemoglobinemia or "blue baby syndrome" in infants as a result of exposure to nitrates. Nitrate levels above this regulatory level have been associated with methemoglobinemia, which is the inability to absorb oxygen in the blood system. Methemoglobinemia is usually discussed with respect to risk in newborns and infants up to 6 months of age. However, adults with reduced stomach acidity, and people deficient in a particular enzyme, are also at risk. Several studies are underway to explore the possible link between long-term exposure to elevated nitrates and the incidence of health problems such as non-Hodgkin lymphoma, miscarriages, diuresis, and hemorrhaging of the spleen. High-nitrate water is generally a health hazard to animals only when used with high-nitrate feed. Short-term use of water containing up to 40 mg/l nitrate is generally considered acceptable for animals.

The Idaho Department of Environmental Quality (DEQ) formed the Ground Water Monitoring Technical Committee to compile the state's ground water nitrate data. This committee identified and delineated 25 areas with elevated nitrate, using ground water data collected through 2000. Any area where 25% or more of the sample wells had nitrate concentrations exceeding 5 mg/l was included on this list. These 25 areas (see Figure 1) were then ranked to determine the severity of the nitrate problem and to establish a work priority for agency resources. These areas are considered critical in terms of ground water nitrate contamination by DEQ. Ranking criteria consisted of population, existing water

¹ In this document, whenever the term "nitrate" is used, it refers to the more scientifically correct term "nitrate as nitrogen" or "nitrate-nitrogen," abbreviated as NO₃-N.

quality, water quality trends, and beneficial uses. The Bliss area was ranked 25th of 25 on this Nitrate Priority list.

To address this issue, DEQ formed a stakeholders group that includes the Gooding Soil Conservation District (SCD), Idaho State Department of Agriculture (ISDA), local producers/land owners operating within the delineated Bliss Nitrate Priority Area (BNPA), the Middle Snake Regional Water Resource Commission (MSRWRC) and the Gooding County Commissioners to design and implement a management plan intended to reduce current nitrate levels and prevent future nitrate level increases.

This plan is intended to be a “Best Management Practices” (BMPs) tool, not an enforcement tool. It is intended to provide direction and guidance to operators/landowners within the BNPA to protect both ground water and surface water from nutrients (nitrates in particular), pesticides, and other contaminants.

At this time, adoption of this plan is strictly voluntary. DEQ will continue to compile and analyze ground water monitoring data collected by all the state agencies. The effectiveness of this voluntary plan will be evaluated, and changes may be initiated depending upon results. If improvements to ground water nitrate concentrations are noted, then regulatory intervention may be avoided.

If ground water quality objectives are not met due to inadequate implementation of best management practices, best practical methods, or other corrective or preventive measures, then regulatory actions as authorized by law may be pursued as set forth in the Ground Water Quality Rule, IDAPA 16.01.11.350.01 and 02.

DEQ and cooperating entities identified land use activities and practices that could potentially affect nitrate levels in local ground water, springs, and surface water. In addition to regulations currently in place, BMPs for some activities/practices will be provided in this document. These activities can be summarized as follows:

- Implement BMPs in Nutrient Management Planning.
- Implement BMPs in Irrigation Management.
- Evaluate effectiveness of existing BMPs related to animal waste materials and provide technical assistance, as needed to dairy and CAFO operations in the BNPA.
- Identify and establish additional ground water quality monitoring sites to better characterize nitrate contamination and nitrate concentration trends.
- Perform water quality monitoring and evaluation of BMP effectiveness in reducing nitrate loading to both ground water and surface water.
- Protect public health and welfare.

Section 1: Background

Nitrate ($\text{NO}_3\text{-N}$) is one of the chemical forms of nitrogen. It coexists with other forms of nitrogen in a complex cycle and can originate from atmospheric deposition, application of fertilizer, manure, waste material, and dead plant and animal tissue. In most natural systems, inorganic nitrogen is a scarce nutrient and plants efficiently use that available nitrate, minimizing any contributions to ground water and surface water. In agricultural systems, nitrate is added to increase yield and production of non-legume crops and it may be present in amounts exceeding what plants are able to use. As a result, excess nitrate can leach into ground water or be washed into surface water.

In 1999-2000, The Department of Environmental Quality (DEQ) analyzed ground water data from around the state with a focus on nitrate. Areas within the state were then placed on a Nitrate Priority Area list. Scores were formulated based on population, ground water quality, the of the nitrate concentration trend, and other beneficial uses of the ground water. The Bliss Nitrate Priority Area (BNPA) was ranked 25th out of 25 areas of concern. Figure 1 shows all 25 nitrate priority areas.

Failure to act and improve ground water quality can result in higher costs to public water systems if treatment becomes necessary to meet safe drinking water standards. These costs would be passed on to the consumer. Additionally, private well owners may need to treat their water if they want to meet those same standards.

The BNPA encompasses 6,800 acres of irrigated agricultural land overlying the Eastern Snake River Plain Aquifer north of the City of Bliss and Interstate 84. Crops grown within the area include alfalfa, wheat, corn, beets, beans, and potatoes. The area encompasses one dairy operation (1,200 – 1,500 head), one former dairy that is in the process of converting to a confined animal feeding operation (CAFO, sometimes called feedlot), which is expected to be a heifer replacement operation of approximately 500 head, and rural housing. Figure 2 shows the delineated area in the Bliss Nitrate Priority Area, the dairy and CAFO within the area, and monitoring wells within and near the area.

Monthly ground water monitoring over a 7-year period, from 1999 to 2006 indicates that nitrate-nitrogen has contaminated local ground water resources. In 2007, analysis of nitrate, bacteria, and nitrogen isotope test results suggest a fertilizer source of contamination.

Additionally, recent and historical ground water monitoring indicate that nitrates have contaminated the source waters of two springs (Butler and Walker springs) within the BNPA. Elevated counts of total coliform bacteria have also, on occasion, been detected in the springs. Butler spring serves as the culinary water source for one of the local ranching operations.

DEQ has designated the area as critical in terms of ground water nitrate contamination.

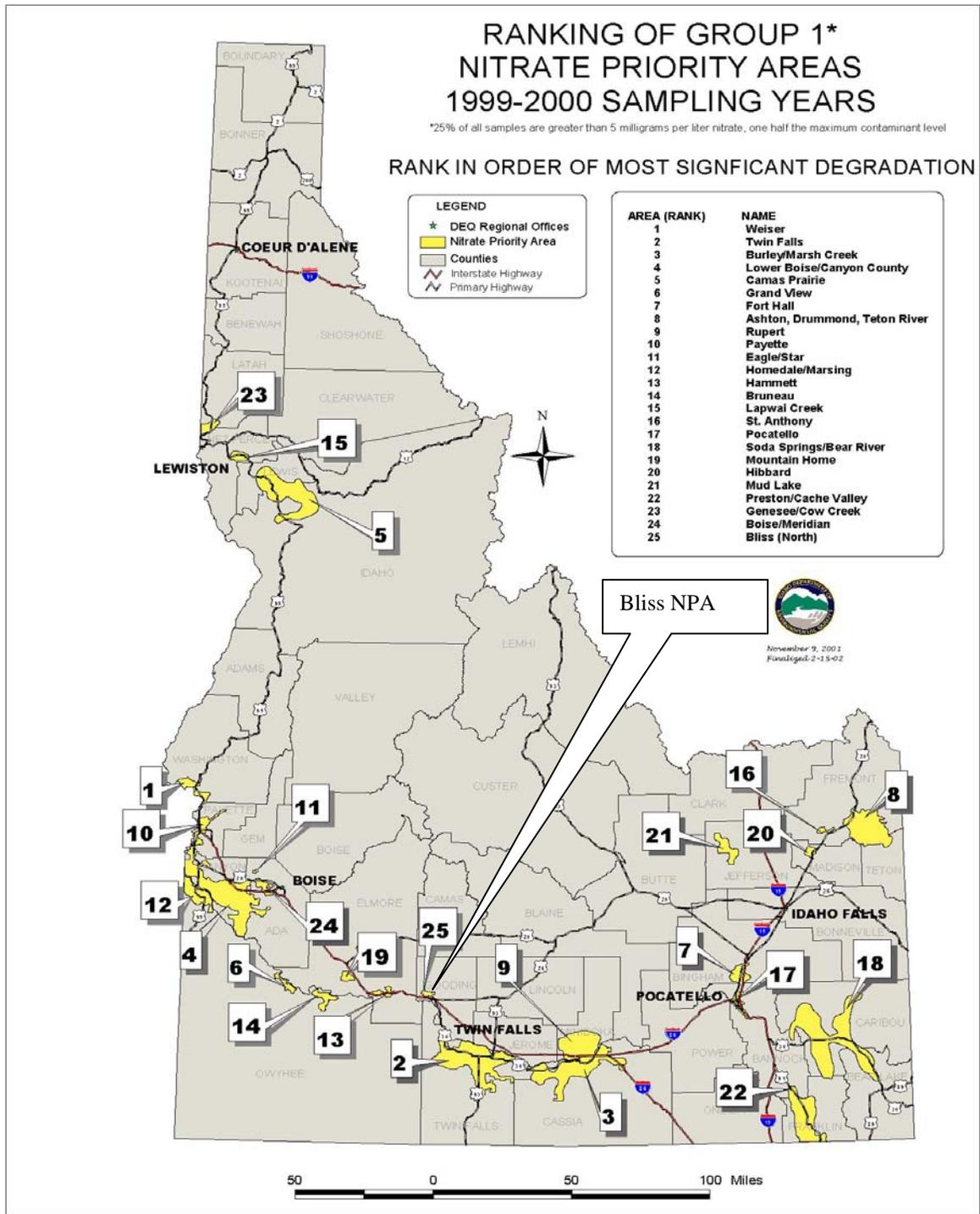


Figure 1. Map of nitrate priority areas in Idaho.

Bliss Nitrate Priority Area

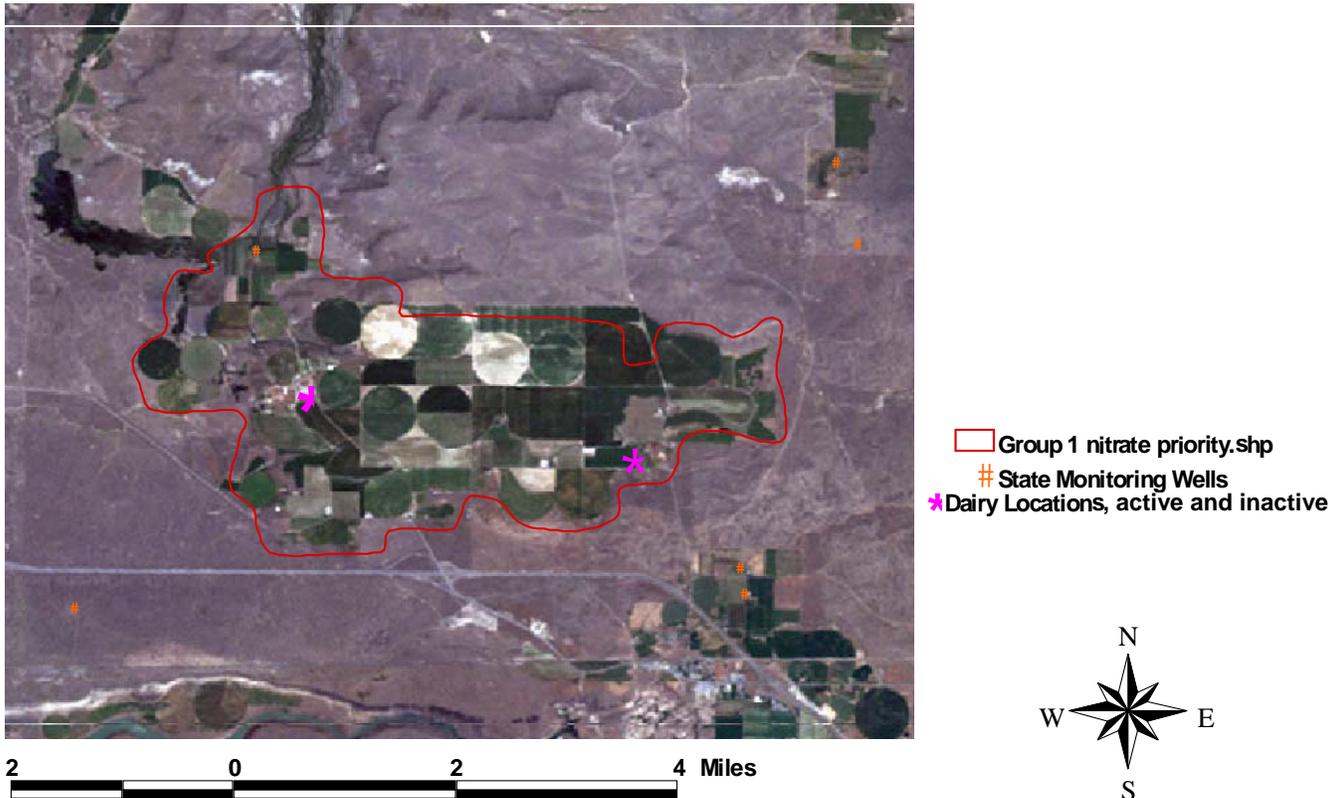


Figure 2. Bliss Nitrate Priority Area with dairy and State monitoring well locations.

The geology in the area is mainly Quaternary basalts and sediments of the Idaho Group geologic formation. Underlying the Quaternary basalt are Tertiary sedimentary rocks of the Glens Ferry Formation and Tertiary Banbury Basalt, both of which are part of the Idaho Group (Garabedian, 1992). Well drillers' logs show that shallow wells in the area are generally completed in the upper Quaternary basalts while deep wells are completed in the lower Banbury Basalt.

Well logs show that depth to ground water in the shallow aquifer ranges from approximately 15 to 85 feet below ground surface. Potential sources of recharge to this shallow system include applied irrigation waters, precipitation, and canal leakage. Potential sources for nitrate contamination of the ground water and springs include application of nitrogen-based fertilizers, cattle manure, land applications of manure, a wastewater lagoon, septic systems, and crop residues.

Authorities

- **The Idaho Department of Environmental Quality (IDEQ) is designated as the primary agency** to coordinate and administer ground water quality protection programs for the state (*Ground Water Quality Protection Act of 1989*, Idaho Code 39-120).
- Idaho Code 39-126 states “Cities, counties and other political subdivisions of the state shall incorporate the ground water quality protection plan in their programs and are also authorized and encouraged to implement ground water quality protection policies within their respective jurisdictions...”
- According to Idaho Code 67-6537 (4) *Local Land Use Planning*, when considering amending, repealing, or adopting a comprehensive plan, the local governing board shall consider the effect the proposed amendment, repeal, or adoption of the comprehensive plan would have on the source, quantity and quality of ground water in the area.
- The *Ground Water Quality Rule* (IDAPA 58.01.11.400.02 and IDAPA 58.01.11.400.03) sets forth a number of alternative actions that DEQ may follow when a numerical ground water quality standard has been exceeded, as well as when no standard has been exceeded but significant degradation of the ground water has been detected. The ground water quality standard addressed in this plan is the primary (health based) drinking water standard of 10 mg/l nitrate.
- In March 2000, DEQ published the *Policy for Addressing Degraded Ground Water Quality Areas* (Policy No. PM00-04). The policy has the following purposes:
 - Set forth a process to identify, designate, and delineate areas where ground water quality is significantly degraded as defined by rule.
 - Develop ground water quality management strategies for improving ground water quality in high priority areas based on current categorization and applicable standards, with the use of local input.

The Bliss stakeholder group used the management strategies and standards developed in the policy to identify recommendations in this plan. The Gooding Soil Conservation District will act, proactively, in an advisory capacity, to improve local ground water quality through the adoption of this plan.

- DEQ formed the Ground Water Monitoring Technical Committee to compile the state’s ground water data. This committee is comprised of technical representatives from local, state, and federal agencies, and interested parties.

In 2000, using ground water data collected through 1999, this committee identified and delineated 25 areas with elevated nitrate. Any area where 25% or more of the sample wells had nitrate concentrations exceeding 5 mg/l was included on this list. The 25

nitrate priority areas were then ranked to determine the severity of the nitrate problem and to establish a work priority for agency resources. Ranking criteria consisted of population, existing water quality, water quality trends, and beneficial uses. The ranked list was finalized in December 2001. For more information on identification and ranking of nitrate priority areas, refer to the DEQ Web site, at http://www.deq.idaho.gov/water/prog_issues/ground_water/nitrate.cfm#ranking.

The Bliss area was ranked 25th of 25 on this Nitrate Priority list.

The Gooding Soil Conservation District will be responsible for the overall coordination and implementation of this management plan, in cooperation with local area residents and government agencies. DEQ is the lead agency assisting the Gooding Soil Conservation District and stakeholders in developing a management plan to address ground water degradation in the BNPA. Other agencies or groups providing technical support include:

- Local growers/land owners
- USDA Natural Resource Conservation Service
- Idaho Soil Conservation Commission
- Idaho Association of Soil Conservation Districts
- University of Idaho Cooperative Extension Service

Section 2: Management Plan Goals

The primary goal of this management plan is to reduce the levels of nitrate-nitrogen (NO₃-N) in the BNPA ground water through education, demonstration, the voluntary implementation of Best Management Practices. Additional goals include:

- Conserve water to allow for future uses within the Middle Snake River Region.
- Improve profitability and quality of return from crop production.
- Increase monitoring and enforcement of non-point water quality standards on discharge to the aquifers and rivers of the region.

Section 3: Management Plan Approach

This BNPA Management Plan is voluntary, based on the premise that the majority of growers and property owners, including dairy and CAFO operations, in the BNPA will be willing to improve and/or modify their management procedures and activities by implementing BMPs to reduce nitrate loading to the ground water. It is the intent that voluntary implementation of this plan will reduce current nitrate levels in the ground water, provide economic advantages to land owners and growers, and eventually remove the BNPA from the state list of areas degraded by nitrates.

If the voluntary approach results in satisfactory progress towards reducing nitrate levels in the ground water, mandatory requirements may not be necessary.

If ground water quality objectives are not met due to inadequate implementation of best management practices, best practical methods, or other corrective or preventive measures, then regulatory actions as authorized by law may be pursued as set forth in the *Ground Water Quality Rule*, IDAPA 16.01.11.350.01 and 02.

Periodically, state and federal agencies, with participating entities, will jointly evaluate the progress and success of this management plan in reducing the nitrate levels in the BNPA. DEQ will provide oversight.

Section 4: Management Plan Objectives

The primary objective of this management plan is to reduce nitrate loading to the ground water. By accomplishing this goal, through education and voluntary implementation of prescribed BMPs, the plan will also promote the following objectives:

- Improve surface water quality.
- Improve water quality of domestic wells and springs.
- Reduce nutrient and sediment loading of surface waters impacting the Mid-Snake River and its tributaries located within the BNPA.
- Reduce surface runoff and topsoil erosion.
- Improve quality of return from crop production.
- Conserve irrigation water.
- Prevent increased costs to potable water consumers by avoiding the necessity for additional treatment in order to comply with water quality standards, in the case of regulated public water supply systems, or voluntarily match the standards, in the case of unregulated/private water wells.

Section 5: Strategies For Implementation

The relatively shallow basalt aquifer in the BNPA is interbedded with clays, lava, and sands (ISDA, well logs), and is vulnerable to contamination. Nitrate-nitrogen is highly mobile in the soil profile and contamination of this shallow aquifer can occur when the combination of applying nitrogen fertilizer in excess of crop needs in conjunction with inefficient irrigation practices allow for the leaching of nitrates (and other potential contaminants) below the root zone where they are unavailable to the crop. The leaching of nitrates to ground water is influenced not only by the amount of nitrogen applied but also the form in which it is applied, the timing and method of application and irrigation management practices used.

Implementation of this plan will focus on specific BMPs as identified in the 319 Project “Bliss Nitrate Priority Area Best Management Practice Demonstration Project.” The main focus of this plan will be implementation of BMPs directed at nutrient and irrigation water management, including these four BMPs:

1. Implement irrigation water management strategies that are crop specific, maximize plant utilization of applied nitrogen, prevent leaching of nitrates below the root zone, maximize yield and conserve water resources.
2. Implement nutrient and soil fertility management plans that will match crop usage of nutrients with application of chemical fertilizer, animal waste, and agricultural solid waste to prevent nitrogen inputs that exceed plant uptake.
3. Provide educational programs that will promote the adoption of efficient and cost effective nutrient, soil fertility, and irrigation water management and crop rotation practices.
4. Promote regulatory compliance of dairy and CAFO operations within the BNPA.

Section 6: Problems And Recommendations

Table 1. Problems and Recommendations

| Problem | Recommendation |
|---|---|
| Inefficient Management of Irrigation Water (100% of current participants use sprinkler systems) | <ol style="list-style-type: none"> 1. Provide educational programs on proper irrigation scheduling, soil water holding capacity, and consumptive use. 2. Encourage the installation of water saving devices such as soil moisture sensors and additional monitoring by crop weather stations and feedback systems. 3. Match irrigation applications more closely to evapotranspiration based on specific crops and soil types. |
| Inefficient Nutrient and Soil Fertilizer Management | <ol style="list-style-type: none"> 1. Match animal waste, agricultural solid waste, and chemical fertilizer application with crop usage of nutrients. 2. Determine fertilizer usage based upon crop demands. 3. Time fertilization to coincide with specific crop nutrient uptake characteristics. 4. Promote crop rotations that maximize utilization of residual nutrient. |
| Dairy and CAFO Nutrient Management Plans (Are they implemented? Are they efficient?) | Determine if established criteria are achieved and if existing BMPs are adequate as designed, installed and maintained, including lagoons and wastewater ponds. |

Section 7: Implementation Tasks

The Gooding Soil Conservation District will act as overall coordinator, in cooperation with other stakeholders, to encourage adoption of this plan and implementation of BMPs identified in the “Bliss Nitrate Priority Area Best Management Practice Project.” The table #2 below describes the specific tasks and identifies the responsible agency/entity and the time frame.

Table 2. Implementation tasks, implementing agencies, and timeframes

| Implementation Task | Agency¹ | Timeframe |
|---|--------------------------------------|------------------|
| Irrigation management | | |
| <ul style="list-style-type: none"> Implement Irrigation Management Plan BMPs and recommendations with participating growers/land owners, as developed in the BNPA 319 demonstration project. | ISDA, Gooding SCD, NRCS, SCC, U of I | 2007 |
| <ul style="list-style-type: none"> Monitor ground water simultaneous with and following installation of nutrient management and irrigation water management BMPs. | Gooding SCD, ISDA, SCC, NRCS | 2007 Ongoing |
| <ul style="list-style-type: none"> Provide oversight of chemigation practices. | ISDA | |
| Nutrient management | | |
| <ul style="list-style-type: none"> Implement Nutrient Management Plan BMPs and recommendations with participating growers/land owners, as developed in the BNPA 319 demonstration Project. | ISDA, Gooding SCD, NRCS, SCC | 2007 Ongoing |
| <ul style="list-style-type: none"> Evaluate nutrient and irrigation input records with ground water quality to gauge effectiveness of BMPs in reducing nitrogen loading. Evaluate bi-annually and adjust implementation practices as needed. | ISDA, Gooding SCD, NRCS, SCC, U of I | 2007 ongoing |
| <ul style="list-style-type: none"> Promote nutrient management planning for third-party applicators of dairy and CAFO waste. | Gooding SCD, ISDA | |
| Dairies and CAFOs | | |
| <ul style="list-style-type: none"> Review nutrient management plans to evaluate plan adequacy. | ISDA, DEQ | 2007 Ongoing |
| <ul style="list-style-type: none"> Request on-site inspections and compliance documents to determine if nutrient management plans and BMPs are being implemented. | ISDA, DEQ, Gooding SCD | 2007 Ongoing |
| Monitoring | | |
| <ul style="list-style-type: none"> Install data loggers to continuously monitor Butler and Walker springs to log any spikes in nitrogen and help determine their source. | ISDA, Gooding SCD, DEQ | 2007 Ongoing |

| | | |
|---|---------------------------------|-----------------|
| <ul style="list-style-type: none"> • Install monitoring wells on the northern edge of the study area and establish a monitoring program. | ISDA, Gooding SCD | 2007 |
| <ul style="list-style-type: none"> • Monitor Walker and Butler spring for other agricultural contaminants as needed. | ISDA, Gooding SCD, DEQ | 2007 |
| <ul style="list-style-type: none"> • Locate any improperly abandoned wells within the BNPA and seek funding to bring them into compliance with IDWR well abandonment standards. | DEQ, IDWR, Gooding SCD | 2007 |
| Education | | |
| <ul style="list-style-type: none"> • Provide educational materials and/or seminars to local growers/land owners on the benefits of nutrient and irrigation management planning. | ISDA, Gooding SCD, U of I | 2007 Ongoing |
| <ul style="list-style-type: none"> • Promote and provide educational materials on Source Water/Wellhead Protection to residents who use ground water or springs as their source of culinary water. Hold public meetings and/or provide progress reports for both participating and non-participating growers within the BNPA (annually, at a minimum, or as results are documented). | ISDA, Gooding SCD, DEQ | 2007 Ongoing |
| <ul style="list-style-type: none"> • Provide local residents with information on proper maintenance and upkeep of individual subsurface septic systems. | Gooding SCD, DEQ | 2007 Ongoing |
| <ul style="list-style-type: none"> • Promote adoption of BMPs to other growers/land owners within the BNPA. | | |
| General | | |
| <ul style="list-style-type: none"> • Provide copies of the final BNPA Ground Water Quality Management Plan to the Gooding County Commission for their approval and adoption. | DEQ, Gooding SCD | 2007 |
| <ul style="list-style-type: none"> • Provide copies of the final BNPA Ground Water Quality Management Plan to Gooding Soil Conservation District Board members and other local decision makers. | DEQ, Gooding SCD | 2007 |

¹Agency abbreviations:

- ISDA – Idaho State Department of Agriculture
- Gooding SCD – Gooding Soil Conservation District
- NRCS – National Resource Conservation Council
- SCC – Idaho Soil Conservation Commission
- U of I – University of Idaho Twin Falls Research and Extension Center
- DEQ – Idaho Department of Environmental Quality
- IDWR – Idaho Department of Water Resources

Section 8: Evaluation of Management Plan Progress and Success

The primary goal of this plan is to reduce nitrate contamination of the aquifer to the extent that the BNPA can be removed from the statewide nitrate priority list. However, due to the slow nature of ground water movement, it is not anticipated that quantitative reductions in nitrate levels will occur during the early implementation of this plan. Therefore, qualitative measures will also be established to evaluate the progress and success of the plan in the short term (3 -5 years). Once the plan is finalized and being implemented, the progress made in reducing nitrate contamination of the ground water will be evaluated through the following activities:

- Agencies and other stakeholders will meet twice a year to review implementation activities that have occurred and evaluate available monitoring results.
- Agencies and other stakeholders will evaluate the effectiveness of the plan and modify it as needed.

A collection of findings from federal, state, and local agencies will be compiled twice a year and be available to the stakeholders as they review implementation and effectiveness of the plan. The Gooding Soil Conservation District, with the support of the stakeholders, will be the lead entity to compile and distribute this information. The first review was conducted in the spring of 2007 and the next is planned for the fall of 2007.

The qualitative evaluation will assess whether the appropriate institutions promoted the plan recommendations. The assessment will include the documentation of activities, practices, and alternatives that have been adopted to reduce nitrate loading to the ground water. This evaluation will also consider whether the protection strategies are still being promoted and what percentage of businesses, landowners/growers/operators, and other organizations are participating in the plan.

Section 9: Responsibilities

- **Project promotion, administrative support, and project management** – Gooding Soil Conservation District
- **Engineering and nutrient management plan development** – Idaho Soil Conservation Commission and the University of Idaho, Twin Falls Research and Extension Center
- **Irrigation water management plan development** – Idaho State Department of Agriculture, and the University of Idaho, Twin Falls Research and Extension Center
- **Monitoring, data management, and reporting** – Idaho State Department of Agriculture, Gooding Soil Conservation District, and the University of Idaho, Twin Falls Research and Extension Center
- **Project management** – Idaho State Department of Agriculture, Idaho Soil Conservation Commission, and the Gooding Soil Conservation District
- **Plan oversight** – Idaho Department of Environmental Quality
- **Plan progress, evaluation** – All parties